Effects of Nutra-Ergonomic Strategies and workstation exercises on Physical, Psychophysiological Measures in Night Shift Visual Display Terminal Users

SHORT SYNOPSIS

Submitted in partial fulfilment of the requirement of the degree of

DOCTORATE OF PHILOSOPHY

to

Manav Rachna International Institute of Research & Studies

(Deemed to be university)

by

ANKITA

Registration number

19/Phd/002

Under the supervision of

Prof. (Dr.) Moattar Raza Rizvi

Dean, Faculty of Allied Health Sciences

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

SECTOR-43, SURAJKUND –DELHI ROAD, FARIDABAD – 121001

Abstract:

Discomfort in the muscles and joints can have a devastating effect on an employee's productivity and quality of life. Most work-related upper extremity disorders (WRMSDs) occur in the neck, and a wide variety of personal, physical, and psychological variables contribute to their onset and progression. Sleep is an essential piece of a healthy way of life, however with modern advances, there are various developing elements that can obstruct this essential work, causing poor sleep quality (Niemiec, Olafsen, Halvari, & Williams, 2022). Shift work initiates some complaints about sleeping problems like a sleeplessness, poor sleep quality, and daytime sluggishness (Yazdi, Sadeghniiat-Haghighi, Loukzadeh, Elmizadeh, & Abbasi, 2014).

Objective: The objective of the study is to find out the effect of intermittent, work station exercises along with nutra-ergonomic strategies on heart rate variability, musculoskeletal issues, sleep quality, eating attitude, cognitive performance and work ability index.

Methodology:

It will be a double blinded randomized controlled trial with two experimental groups. The study setting will be the multinational companies offering night shift on regular basis. The age will be from 25-35yrs. After taking baseline measurements for resting heart rate variability, heart rate recovery, self-rated musculoskeletal diseases, sleep quality, cognitive functions, eating attitude, QoL and work ability index, they will be divided into 3 groups. Group A will be control group, group B will receive Nutra ergonomic strategies, and group C will receive Nutra ergonomic strategies and intermittent workstation exercises. The intervention will be given for 3 weeks, and they will be accessed for the same parameters later.

Abbreviations:

MSD: Musculoskeletal disorders

WRMSDs: Work related musculoskeletal disorders

VDT: Visual display terminal

QoL: Quality of life

CVD: Cardiovascular diseases

Contents

S no	Description	Page No.
1	Introduction	1-4
2	Objective	6
3	Literature Review	9-11
4	Methodology	12-18
5	References	19-21

FACULTY OFALLIED HEALTH SCIENCES

Certificate

I hereby declare that the short synopsis "Effects of Nutra-Ergonomic Strategies and - workstation exercises on Physical, Psychophysiological Measures in Night Shift Visual Display Terminal Users" being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in Physiotherapy under faculty of Allied Health Sciences of Manav Rachna International Institute of Research & Studies, Faridabad during the academic year 2022-2023

It is a bona fide record of original work carried out under the supervision of Prof(Dr.) Moattar Raza Rijvi and has not been submitted in full or part to any other university or institute for degree or diploma. Further, it is certified that short synopsis is plagiarism free and proof has been submitted.

Ankita
19/PhD/003

Prof(Dr.) Moattar Raza Rijvi
Dean,
Faculty of Allied Health Sciences

(Chairman, DRC)

Chairperson, CDP

Introduction:

Discomfort in the muscles and joints can have a devastating effect on an employee's productivity and quality of life. As if that weren't bad enough, these aches and pains can also make it tough for workers to carry out a wide range of routine tasks. According to the Occupational Safety and Health Administration (OSHA), the leading causes of musculoskeletal illnesses (MSDs) include "vigorous physical activity," "uncomfortable and inflexible postures," "repetitive motions," and "vibration" (OSHA)(Shavarani & Korhan, 2015). According to Young Me kim et al, 2017, the risk of MSD increases with amplified work, job unhappiness, and stress. Musculoskeletal problems also lower organisations' earnings and increase governments' social costs(Kim & Cho, 2017). WRMSDs are the leading cause of worker pain, decreased productivity, and economic expenditures. Increasing industrial technology led to increased computer usage. In offices, the use of computers and VDTs for work reasons is increasing. These personnel are susceptible to ergonomic and visual issues, as well as repetitive strain injuries, which can lead to musculoskeletal illnesses (WRMSDs). These problems produced by computer use could harm not only the job, but also continue after retirement. As a result, people both in the labour force and in retirement might expect a decline in their quality of life as a result of these circumstances. Because of this, the value of creating a desk that is both comfortable and functional has been highlighted. However, many governments, especially developing ones, do not devote enough resources to ergonomics education. Furthermore, many firms choose to overlook the issue, unaware of the long-term implications, because hiring ergonomics professionals is prohibitively expensive (Service, Education, Unit, Safety, & Administration, 1999; Shavarani & Korhan, 2015).

Most work-related upper extremity disorders (WRMSDs) occur in the neck, and a wide variety of personal, physical, and psychological variables contribute to their onset and progression(Mohammadi, 2012). Work-related physical aspects include bending, static sedentary posture, and job demands; work-related psychosocial factors include overtime and time spent trying to meet deadlines; and individual factors include age, gender, education level, smoking habits, etc(Aptel, Aublet-Cuvelier, & Cnockaert, 2002).

WRMSDs can occur when demands placed on a person's musculoskeletal system at work are greater than their biomechanical capacity. According to some, WRMSDs are the major cause of absenteeism and impairment(Karsh, 2006).

India's IT sector has developed into a large specialised cooperation, placing the country at the forefront of the digital revolution(Kaka et al., 2021). By the end of the 1990s, it was estimated that 40–80 million VDTs were in use worldwide. There are roughly 18 million personal computers (PCs) in use, or about six per every thousand people and their number expanding constantly (Safety & Administration, 1997; Smith, 1997).

IT organization occupations are known to be more competitive and exhausting due to their temperament of work like objective accomplishments, night shift, and burden of work. The occurrence of sleep issues is regular in shift workers, however it is frequently underdiagnosed (Jehan et al., 2017).

The concentration of melatonin in plasma or saliva is commonly applied as a physiological marker of the biological clock because it is light sensitive and is secreted by the pineal gland. (Arendt, 1998). Exposure to light at 2,500 lx suppresses nighttime melatonin production in humans, as initially shown by Lewy et al. in 1980 (Lewy, Wehr, Goodwin, Newsome, & Markey, 1980). Exposure to light levels of several hundred lux has been demonstrated in recent research to decrease melatonin release at night (Tähkämö, Partonen, & Pesonen, 2019).

Sleep is an essential piece of a healthy way of life, however with modern advances, there are various developing elements that can obstruct this essential work, causing poor sleep quality (Niemiec, Olafsen, Halvari, & Williams, 2022). In an IT professional's job, present advancement is empowered by adaptable working hours (Rubery & Grimshaw, 2001). Poor sleep quality can cause a sleeping disorder called insomnia and can also decrease the quality of life (QoL). The relationship between sleep issues and shift work is bidirectional (Ishak et al., 2012). Shift work initiates some complaints about sleeping problems like a sleeplessness, poor sleep quality, and daytime sluggishness (Yazdi, Sadeghniiat-Haghighi, Loukzadeh, Elmizadeh, & Abbasi, 2014).

Heart disease is a leading cause of death in the West, and it is estimated that 10–20% of all heart disease deaths among those of working age are attributable to occupational factors (Roth, Mensah, & Fuster, 2020). After the first five years, they predicted a seven percent increase in risk for every five years of shift/night employment. According to prospective observational studies analysed in another systematic review with meta-analysis, those who work long hours face a risk of coronary heart disease that is roughly 40 percent higher than the general population (Lunde et al., 2020).

Long hours worked at night and during the day could lead to cardiovascular disease through a number of different mechanisms (Puttonen, Härmä, & Hublin, 2010). Prolonged exposure to psychological stress has been linked to hypersecretion of cortisol and catecholamines, which may play a role in illnesses that raise the risk for cardiovascular disease. (Virtanen et al., 2012). It has also been hypothesised that "light at night" can suppress the body's natural production of melatonin, resulting in metabolic disruptions. The link between shift work and cardiovascular disease may be mediated by a number of factors, including but not limited to: sedentary lifestyle, poor diet, excessive alcohol use, excess weight, tobacco use, dismissal of health warning signs, hypertension, and metabolic syndrome. Sleep has a role in many different physiological processes in living beings, therefore it's no surprise that it's considered a vital biological function. Humans need on restful sleep for their physical, mental, and emotional health, and those who regularly go without enough of it tend to be less productive.

Despite decades of discussion, there is still no agreement on how to quantify quality of life (QoL). Quality of life evaluation, however, necessitates a subjective and multidimensional strategy, which must take into account not just physiological but also psychological well-being and social connections (Laranjeira, 2008). Some professions may be at a disadvantage due to inflexible aspects of their careers. Working in shifts without time off during the week might throw off your body's natural sleep-wake cycle, reducing your quality of sleep. Occupational stress can be caused by several things, including a hectic work environment, long hours, and shift work. (Palhares, Corrente, & Matsubara, 2014).

To measure how well one sleeps, Buysse et al. devised the Pittsburg Sleep Quality Index (PSQI), a self-administered questionnaire (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). Memory, learning, logical reasoning, mathematical computations, pattern recognition, sophisticated language processing, and decision making are just some of the cognitive abilities that suffer from a lack of sleep (Krueger, 1989).

The health and quality of life of economically active adults are negatively impacted by shift work, which is defined as "any work organisation that deviates from the regular diurnal work period." Because it frequently goes against the diurnal human rhythmic timing system, shift work can disrupt family and social life and increase chronic fatigue, drowsiness, and somatic problems. Nevertheless, shift employment is becoming increasingly common in economies that rely on the production, transportation, retail, service, and hospitality industries (Costa, 2010).

In the current day, variations in life style and dietary patterns coming from quick modernization have supported an expansion in the event of degenerative diet regimen related illness and non-transmittable illness (Al-Maskari, 2010). Shift workers deals with the changing hours of the day or work at consistent hours of the day outside the regular all day. Shift work can vary diet duration and a good nutrition can be hard to keep up, particularly if the resources for having food exterior the general working duration are not systematized and nutritious diet options are not achievable. Night workers have a changed diet consumption, comparatively with day workers manifest by a strong snacking habit through the nighttime duration of work (Nea, Kearney, Livingstone, Pourshahidi, & Corish, 2015).

When our typical sleep, wake, and eat schedules are disrupted by shift work, our internal circadian biological clock becomes misaligned, posing serious health risks (Ekmekcioglu & Touitou, 2011; Morris, Purvis, Hu, & Scheer, 2016). Because of this, shift workers are more prone to gain weight than their non-shift working peers (Shaw et al., 2019), even accounting for common danger indicators like exercise and weight. It's possible that shift workers' diets play a role in disease risk. A deeper knowledge of shift employees' eating habits is necessary to lessen the negative effects of working irregular hours. is regulated by the hypothalamic suprachiasmatic nucleus (SCN), also called the "master circadian clock," which keeps all the other clocks in the body in sync (Laermans & Depoortere, 2016). The liver is a peripheral clock that influences energy metabolism through the generation of regulatory proteins and enzymes involved in bile acid synthesis, glucose and lipid metabolism, and triglyceride and cholesterol synthesis. Detrimental effects on cardiometabolic health have been linked to disruptions in the circadian control of glucose, insulin, and the appetite regulating hormones ghrelin and leptin (Reinke & Asher, 2016). Furthermore, peripheral oscillators of the circadian clock have been demonstrated to be influenced by timing and dietary content in such a way that it decouples from the SCN. These findings imply that night shift workers may have circadian misalignment, which, when combined with unhealthy eating habits and missed meals, might further impede the diurnal variation in energy metabolism and exacerbate the detrimental consequences on health. Night shift employees have unique needs, including improved alertness and performance, which must be taken into account when designing nutritional interventions.

Statement of problem

1. While India's IT sector works day and night to advance the country, also they have to change their day and night timing shift as per the demand through their higher authority which lead to alter in their sleep timing, eating hours as well.
2. Night shift work disrupts the circadian rhythm, resulting in a variety of health problems.
3. Factors that raise the odds of becoming obesity also raise the odds of developing cardiovascular disease, psychological disorders, digestive issues, and road and occupational accidents. Constant sitting on the job, along with poor ergonomics, is a major cause of fitness issues among office workers.
4. Absenteeism and diminished job capacities continue to wreak havoc on employment standards. There is a dearth of study data on cardiac autonomic functioning and psychological markers in night shift VDT users.

Significance of the study

The current study is going to find out the effect of intermittent, work station exercises along with nutra-ergonomic strategies on heart rate variability, musculoskeletal issues, sleep quality, eating attitude, cognitive performance and work ability index. The focus of the study is to find out the measures that can be advised on work station for night shift IT workers to improve their quality of life and in turn improving the employment standards. The study is further going to focus on reducing the health risks for night shift workers by implementing the guidelines for work station activities and eating pattern during working hours if the clinical relevance of the study is established.

Aim

The aim of this study is to investigate the effect of intermittent, work station exercise and nutra-ergonomic strategies on cardiac autonomic function, musculoskeletal disorders, sleep quality, work ability index, higher mental abilities and quality of life.

Objectives

Primary objectives

1. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on cardiac autonomic functions in night shift visual display terminal users
2. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on self rated musculoskeletal disorders in night shift visual display terminal users
3. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on psychological measures in night shift visual display terminal users
4. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on cognitive performance in night shift visual display terminal users.

Secondary objectives

1. To formulate the basic clinically significant nutra-ergonomic guidelines for night shift visual display terminal users.
2. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on eating attitude of the night shift visual display terminal users.
3. To find out the effect of intermittent, work station exercise and nutra-ergonomic strategies on quality of life and work ability index in night shift visual display terminal users and to apply the guidelines for the societal benefits.

Experimental Hypothesis

1. There will be statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on cardiac autonomic functions in night shift visual display terminal users.
2. There will be statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on self rated musculoskeletal disorders in night shift visual display terminal users.
3. There will be statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on sleep quality in night shift visual display terminal users

4. There will be statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on cognitive performance in night shift visual display terminal users.
5. There will be statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on work ability index in night shift visual display terminal users.

Null Hypothesis

1. There will be no statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on cardiac autonomic functions in night shift visual display terminal users.
2. There will be no statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on self rated musculoskeletal disorders in night shift visual display terminal users.
3. There will be no statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on sleep quality in night shift visual display terminal users
4. There will be no statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on cognitive performance in night shift visual display terminal users.
5. There will be no statistically significant effect of intermittent, work station exercise and nutra-ergonomic strategies on work ability index in night shift visual display terminal users.

Operational Definitions

Night shift Visual display terminal users:

"The professionals who are using the computers for more than 7hrs in non usual shift i.e. after 6 pm regularly form at least last 4 weeks".

Nutra-ergonomics:

"Nutra-ergonomics describes the interface between workers, their work environment, and performance in relation to their nutritional status. It considers nutrition to be an integral part of a safe and productive workplace that encompasses physical and mental health as well as the long-term wellbeing of workers".

Autonomic functions

"The autonomic functions are the functions regulated by autonomic nervous system such as heart rate, cognitive functions, breathing, digestions".

Workstation exercises

"The exercises that will be done at the work site in active breaks are called as Workstation exercises".

Review of Literature:

Sleep Quality in Night Shift workers

- It was concluded in research done on IT professionals to determine the elements related to work that contribute to their lack of sleep, insomnia, and excessive work hours. A significant link was seen between extended work hours and inadequate rest time among IT professionals (Kivistö, Härmä, Sallinen, & Kalimo, 2008).
- Yazdi et al., (2014) analyzed the incidence of sleep problems and their effects on job performance among shift workers and those who don't work shifts. The Pittsburg Sleep Quality Index, the Berlin Questionnaire, the Epworth Sleepiness Scale, the Insomnia Severity Index, and the Restless Legs Syndrome Questionnaire are all used to compile this information. Researchers also discovered that shift workers are disproportionately affected by sleep disturbances.
- There is a correlation between good sleep and happiness among SRMIST's IT staff in Kattankulathur, Kancheepuram found out by Mathiazhakan & Jayabharathi. They arrived at the conclusion that good sleep is crucial to overall health. Since they discovered that 86% of IT professionals reported a high level of satisfaction with their lives overall, they deduced that if IT professionals' sleep quality was also high, their overall satisfaction with life would also be high (Mathiazhakan & Jayabharathi, 2019).
- Beebe et al., (2017) studied the effects of shift work on nurses' eating habits and sleeping patterns. There was no discernible difference in diet quality or sleep quality between day and night shift workers. Nonetheless, they discovered a connection between BMI and sleep quality, and between BMI and the quality of one's food. Inactive nurses with a higher body mass index tend to have worse quality diets and less restful nights of sleep.

Diet Quality in Night Shift IT Professionals

Sharma et al. (2012) analysed the eating trends, interests, and habits of IT workers. They also came to the conclusion that men are more likely than women in the workplace to nibble on fried foods, fast food, and other junk food while using a computer.

- Divakar & Nirmala, (2014) professionals in the software sector had their eating habits and nutritional health examined. Consumption of green leafy vegetables, fruits, fruit

juices, milk, and milk products, and savoury foods was significantly correlated with higher income.

- It was examined that the eating habits, physical activity levels, and overall health of those working in the software business. The researchers discovered that people's calorie, protein, and fat consumption were all greater than advised. In addition, they discovered that the vast majority of participants maintained a modest pattern of eating throughout the study (Reynolds, 2019).
- Nea et al., (2015) researches and looked at shift workers to determine the relationship between their eating and living habits and the risk of illness. They discovered a general pattern linking shift employment to unfavorable results in terms of a variety of lifestyle behaviors and health concerns. They also complained about the group's general lack of information on health and how to make positive changes in that area.

Musculoskeletal problems in Night Shift IT Professionals

- Sethi et al., (2011) researched the impact of employees' BMIs on their mental and physical health in an office setting with advanced ergonomic controls. Results showed that even in an advanced ergonomic setting, there was a substantial effect of body mass index on computer employees' posture, musculoskeletal pain at work, stress at work, and flexibility. (Sethi, Sandhu, & Imbanathan, 2011)
- Vijay (2013) did a prevalence study on musculoskeletal health problems in the IT workforce. His research led him to the conclusion that IT workers are disproportionately affected by work-related musculoskeletal ailments, a problem that requires immediate treatment.
- Shrivastava & Bobhate (2012), conducted a cross-sectional survey of IT workers in Mumbai to assess the prevalence of health issues triggered by time spent in front of a computer. According to their findings, the most common health issues among software developers are related to the eyes, the muscles, and the brain.

Above literature shows that sleep quality, diet quality and musculoskeletal problems are major concern in IT Professionals. Sleep and diet quality are affected due to long working shift patterns which leads to various musculoskeletal disorders. However, in day shift workers, these problems are not much critical as they are in night shift. Therefore, there is need to compare

day and night shift's working environment to calculate a correlation between day and night shift worker's sleep quality, diet quality and musculoskeletal problems.

HRV for the analysis of ANS

Evaluating the sympatho-vagal balance in the sinoatrial stage has never been easier than with HRV analysis. Heart rate variability (HRV) is a noninvasive electrocardiographic measurement used to assess the balance of sympathetic and vagal activity in the sinus node. It serves as the film's focal point (Sztajzel, 2004). The autonomic tone can be assessed through a series of observations of sinusoidal RR interval changes, which is what heart rate variability (HRV) analysis does. Physiological influences on HRV include gender, age, circadian rhythm, respiratory rate, and body position. Taking a reading of your heart rate variability (HRV) won't take up much of your time and won't be painful. Plus, they're simple to duplicate. In the field of dynamic electrocardiography, Holter records with durations as short as 0.5 to 5 minutes are used most frequently (ChuDuc, NguyenPhan, & NguyenViet, 2013).

Autonomic dysfunction and Heart rate variability

Cardiovascular autonomic dysfunction happens when the heart's muscles and blood vessels are injured, resulting in abnormal heart rate control and vascular dynamics. Autonomic dysfunction manifests itself in a variety of ways. Sinus tachycardia, exercise intolerance, orthostatic hypotension, and asymptomatic myocardial ischemia are both signs(Goldberger, Arora, Buckley, & Shivkumar, 2019). Reduced heart rate variability is one of the first subclinical manifestations of cardiac autonomic dysfunction, occurring in conjunction with sympathetic dysfunction (Khandoker, Jelinek, Moritani, & Palaniswami, 2010). The ANS carefully regulates the heart rate. Changes in parasympathetic, sympathetic nervous system activity result in beat-to-beat heart rate variance, which indicates autonomic nervous system activity (HRV). Variability of the heart rhythm is altered in pathological states such as ischemic heart disease, type 2 diabetes and decreased variability is associated with worse outcomes. In a cross-sectional study among IT Professionals in Mumbai to examine their computer related health problems (Shrivastava & Bobhate, 2012). They concluded in their study that ocular discomfort, musculoskeletal disorders and psych-social problems were the key health problems in software professionals. Cardiac autonomic disorder is a condition of type 2 diabetes that increases the risk of death by nearly fivefold in adults.

Methodology:

Study Design

Single blinded randomized controlled trial with two experimental groups

Study Setting

The multinational companies offering night shift on regular basis

Subjects

The night shift professionals who are working in night shift from last 4 weeks and will be continuing to work in night shift for at least next 10 weeks will be included in the study

Sampling Technique

Convenience sampling technique will be used in this study.

Study Duration

The duration of study will be 10 weeks

Sample Size

The number of subjects who will be included in the study was determined by G-Power, in a previous study the sleep pattern using Pittsburgh sleep quality index was compared to day shift workers. The effect size was found out to be 0.567. The values 4.25 of night shift and the mean sleep scored to day shift workers 2.9 which is to be allowed by the intermittent, workstation exercise and nutra-ergonomic strategies to be given, 28 subjects (including 10% dropouts) will be required in each group. Considering 2-tailed, alpha level of 0.05 and power of 0.8. We assumed a SD of 2.38 of response variable. Total 84 subjects were shown to be necessary for the study.

Inclusion criteria

- Age 25-35 years
- Subjects of both genders
- Educational qualification: Professional degree and above in engineering and computer science
- Working from past 6 months and from last 4 weeks in night shift
- Subjects working duration: 6 hours or more per day
- Subjects did not perform stretching exercises/protocols past one year

- Willingness towards participation
- Not on any medications for metabolic diseases.

Exclusion criteria

- People suffering from chronic illness except occupational related
- Subjects who underwent major surgery.
- Part-time workers, Shift workers.
- Subjects with continuous visual disorders.
- Post-traumatic stiff joint, fixed deformity, weakness and paralysis of limbs.
- Diagnosed with any cardiovascular impairment.
- Following any customized diet patterns.
- Pacemakers.

Dependent Variables

- Resting Heart rate variability.
- Heart rate recovery.
- Self rated musculoskeletal diseases.
- Sleep quality.
- Cognitive functions.
- Eating attitude.
- Quality of life.
- Work ability Index.

Independent variables

- Intermittent exercises.
- Workstation exercises.
- Nutra-ergonomic strategies.

Instrumentation

- Weighing machine
- Stadiometer
- Sphygmomanometer
- AD instruments power lab with HRV module
- Stroop test for adults.
- Coronell's musculoskeletal questionnaire

- Pittsburg sleep quality index
- EAT-26
- WHOQOL-Bref
- WAI- work ability index

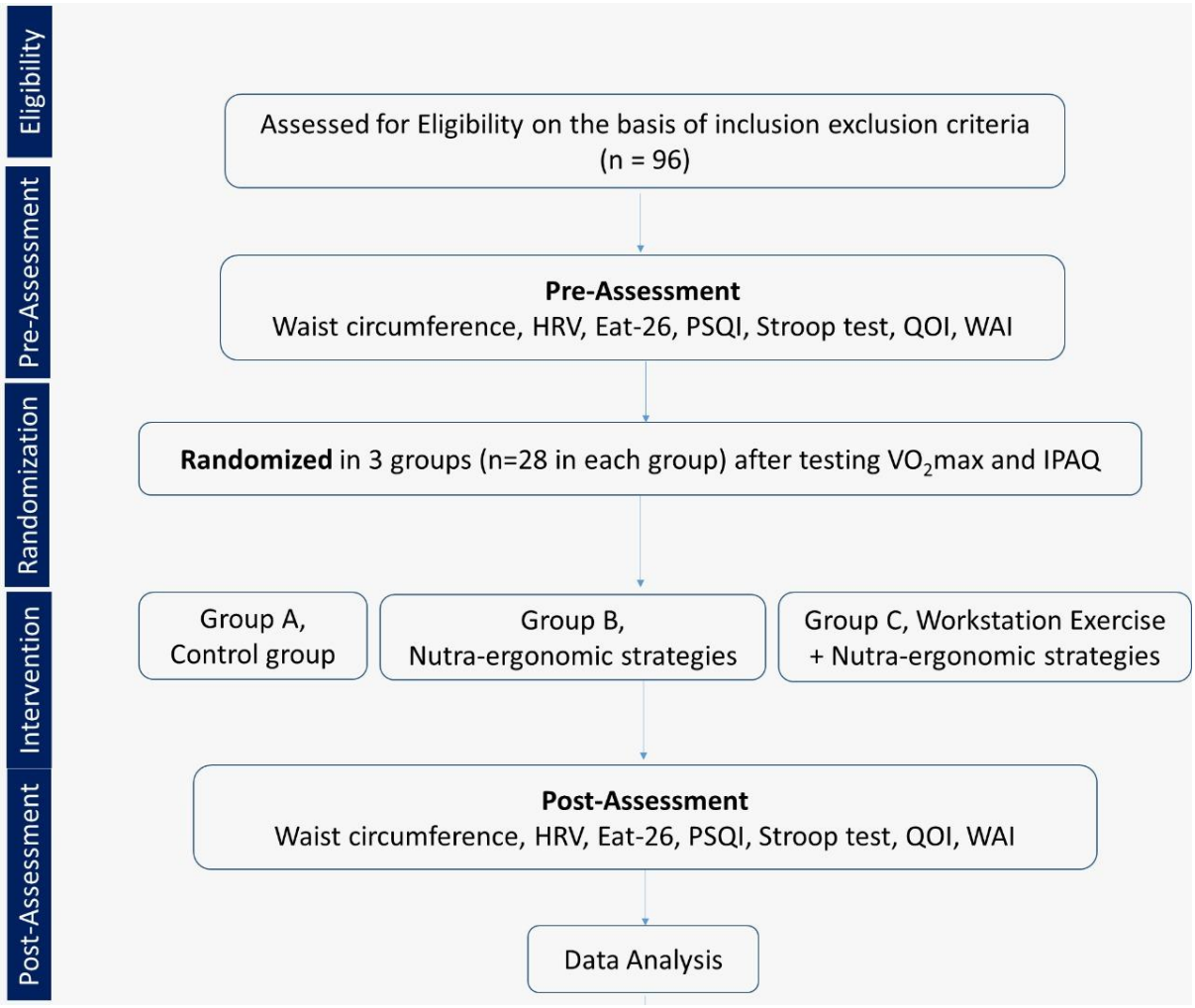

Eligibility
Pre-Assessment
Randomization
Intervention
Post-Assessment
Assessed for Eligibility on the basis of inclusion exclusion criteria (n = 96)
Pre-Assessment
Waist circumference, HRV, Eat-26, PSQI, Stroop test, QOI, WAI
Randomized in 3 groups (n=28 in each group) after testing VO2max and IPAQ
Group A, Control group
Group B, Nutra-ergonomic strategies
Group C, Workstation Exercise + Nutra-ergonomic strategies
Post-Assessment
Waist circumference, HRV, Eat-26, PSQI, Stroop test, QOI, WAI
Data Analysis

Figure 1: Flow for methodology of the study

Procedure

The participants working through the night Companies in the Delhi NCR area that have a regular night shift will be searched for prospective VDT users based on inclusion and exclusion criteria. Participants will be made aware of the study's existence. During the course of the research, they will be briefed on the study's goals, methods, and any associated risks. A consent form outlining their protections as study participants will be sent to them. Manav Rachna

International Institute of Research and Studies's institutional ethics committee has been contacted and will provide its approval before work can begin. Each subject will be assigned a number in order to protect their anonymity, and this number will be used throughout the permission form and demographic/injury history questionnaire. A physician or other medical professional will be consulted for a physical and to issue a fitness certification.

First evaluation will be included descriptive information such as age, gender, height, weight, waist circumference, timings of work. The subjects then will be accessed for VO2 Max using the beep test. Current physical activity of the subjects will then be accessed using the IPAQ questionnaire. The subjects falling in the category of HEPA will be excluded from the study. Subjects will then be evaluated for cardiac autonomic function by AD instruments power lab with heart rate variability module. The cardiac function will be assessed for heart rate, blood pressure.

Assessment tools:

- Coronell's musculoskeletal questionnaire for self-rated musculoskeletal diseases will be assessed before applying intervention.
- Pittsburg sleep quality index- For knowing the quality of sleep.
- Stroop test- For measuring Cognitive functions.
- EAT-26- For measuring eating attitude.
- 24 Hr dietary recall will be taken for 3 days, in this one day has to be the off day of the individual.
- WHOQOL-Bref- For measuring quality of life.
- WAI- work ability index- For measuring ability to work

Intermittent workstation exercises

According to defined category of 'American college of Medicine' the subjects will be instructed to briskly walk by maintaining 60-79% of their maximum heart rate i.e. moderate intensity exercise as taken out by the beep test during VO2 max test. Heart rate monitors in the smart watches will be accessed for the moderate intensity zone training. The exercises will be done under the supervision of the therapist. The subjects will be doing the intermittent exercises for 3 days a week, 30 mins in a day. 30 min duration of exercises will be again divided into 3 bouts of 10 mins each. There will be a 4 hr gap in between three bouts of the exercises, for eg if the work shift is starting at 6pm, the timings of 3 bout of exercises will be

6pm, 10pm and 2am. The participants will be encouraged to maintain the dairy for the walking routine and to follow the same for 10 weeks.

Intermittent Workstation stretches/exercises

The intermittent workstation stretches will include 36 stretches for troublesome areas such as the neck, shoulder, arm, hand, and wrist, lower back, and lower limbs. FLIP (Facsimile Lesson with Instructional Pictures) will be utilised to conduct the exercises(Marangoni, 2010). The participants will use a kitchen timer that is set for 10 minutes. After 10 minutes, the individual will flip the card and perform the activity for 10-12 seconds. If the exercises begin at the beginning of the shift and 10 seconds of stretching are conducted every 10 minutes, all the exercises will be delivered within six hours of the work shift, and the total time of the workouts will be 6-7 minutes. The chart for the same has been added as Annexure A.

Nutra-ergonomic Recommendations

The participants of the study will be guided for the nutra-ergonomic strategies based on the dietary recommendations and to be finalized after the pilot study to note the minimal clinical changes(Shearer, Graham, & Skinner, 2016). The recommendations will be as follows:

- Workers should be encouraged to maintain adequate hydration. The hydration includes water and beverages. The estimated water intake should be more than 2.7 litres for a men. The recommendation for beverages includes the non-caffeinated and low sugar drinks only. Milk intake should be 250 to 300 ml for men in sedentary and moderately active lifestyle
- The caffeine intake should be curtailed to maximum of 200mg in a day. The caffeine content of some of famous caffeinated drinks are
    1. Brewed coffee-1cup(150 ml)- 80-120 mg of caffeine
    2. Instant coffee-1cup (150 ml)- 50-65 mg of caffeine
    3. Milk tea-1cup (150ml)- 30-65 mg of caffeine

    The caffeinated drinks should be taken into moderation so as not to exceed the recommended values and they should be avoided 1 hr before and after meals, to avoid the absorption of iron.
- Carbohydrates recommended for a male of sedentary and moderately active lifestyle is 50-65% of total recommended calorie intake and maximum of the calories should come from complex carbohydrates.

- The recommended amount of protein for an adult male is 1gm/g of body weight and this ratio should not increase more than 20-30% total recommended calorie intake.
- The daily recommended intake for visible fat should not be more than 25-30gm/day and maximum of it should be from good fat i.e nuts and seeds.
- The daily recommended value for calcium is 600mg/day. The sources of calcium should be free from excessive calories and fats.
- Iron is a needed for maintaining the mental functions, the recommended iron dosage for a male is 17mg/day.

Balanced snacks and lunches should be always available to workers, or workers should be encouraged to bring their own to the office. These should provide a wide selection of meals that are in keeping with modern dietary recommendations. Higher intensity jobs may necessitate more calories, so it's important to tailor meal planning accordingly. Similarly, there should be a sanitary, peaceful (little industry-related or machine noise) and inviting space for employees to eat in provided by their business. Kitchen amenities like microwaves, dishwashers, and dishwashing sinks also contribute to a more sanitary environment for eating. Following the guidelines issued by the Indian Institute of Nutrition, they will be provided with information on the quantities of food, sample diet plans, and main components of certain well-known Indian dishes.

Stroop Test

"The Stroop Test, also known as the color-word naming test, has been used in over sixty published psychological studies since the test was originally described by Stroop. The test has been used to attempt to measure a variety of processes and traits in the cognitive and personality domains" (Scarpina & Tagini, 2017).

Cardiac autonomic function:

Influence of sympathetic and parasympathetic nervous system over heart. The cardiovascular system is significantly regulated by the autonomic nervous system (ANS). In the near term, it controls blood pressure and heart rate to deal with challenges. Heart rate and cardiac contractility are decreased by parasympathetic (vagal) regulation, whereas sympathetic branch activity counteracts these effects and controls peripheral vasoconstriction (Hägglund et al., 2012).

WHOQoL-Berf

It includes the individuals's perception towards their own QoL. It consists of 26 questions, there are 2 general items based on QoL and 24 questions to know the person's perception on aspects related to their physical condition, cognitive condition, social relations and social reoles also the living environment (Canavarro et al., 2009).

REFERENCES

Al-Maskari, F. (2010). Lifestyle diseases: An economic burden on the health services. *UN Chronicle. The Magazine of the United Nations, 5*, 1-2.

Aptel, M., Aublet-Cuvelier, A., & Cnockaert, J. C. (2002). Work-related musculoskeletal disorders of the upper limb. *Joint bone spine, 69*(6), 546-555.

Arendt, J. (1998). Melatonin and the pineal gland: influence on mammalian seasonal and circadian physiology. *Reviews of reproduction, 3*, 13-22.

Beebe, D., Chang, J. J., Kress, K., & Mattfeldt-Beman, M. (2017). Diet quality and sleep quality among day and night shift nurses. *Journal of nursing management, 25*(7), 549-557.

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry research, 28*(2), 193-213.

Canavarro, M. C., Serra, A. V., Simões, M. R., Rijo, D., Pereira, M., Gameiro, S., . . . Paredes, T. (2009). Development and psychometric properties of the World Health Organization Quality of Life assessment instrument (WHOQOL-100) in Portugal. *International journal of behavioral medicine, 16*(2), 116-124.

ChuDuc, H., NguyenPhan, K., & NguyenViet, D. (2013). A review of heart rate variability and its applications. *APCBEE procedia, 7*, 80-85.

Costa, G. (2010). Shift work and health: current problems and preventive actions. *Safety and health at Work, 1*(2), 112-123.

Divakar, S., & Nirmala, C. (2014). FOOD HABITS AND NUTRITIONAL STATUS OF PROFESSIONALS IN SOFTWARE INDUSTRY. *Journal of Community Nutrition & Health, 3*(1), 3.

Ekmekcioglu, C., & Touitou, Y. (2011). Chronobiological aspects of food intake and metabolism and their relevance on energy balance and weight regulation. *Obesity reviews, 12*(1), 14-25.

Goldberger, J. J., Arora, R., Buckley, U., & Shivkumar, K. (2019). Autonomic nervous system dysfunction: JACC focus seminar. *Journal of the American College of Cardiology, 73*(10), 1189-1206.

Hägglund, H., Uusitalo, A., Peltonen, J. E., Koponen, A. S., Aho, J., Tiinanen, S., . . . Tikkanen, H. O. (2012). Cardiovascular autonomic nervous system function and aerobic capacity in type 1 diabetes. *Frontiers in physiology, 3*, 356.

Ishak, W. W., Bagot, K., Thomas, S., Magakian, N., Bedwani, D., Larson, D., . . . Zaky, C. (2012). Quality of life in patients suffering from insomnia. *Innovations in clinical neuroscience, 9*(10), 13.

Jehan, S., Zizi, F., Pandi-Perumal, S. R., Myers, A. K., Auguste, E., Jean-Louis, G., & McFarlane, S. I. (2017). Shift work and sleep: medical implications and management. *Sleep medicine and disorders: international journal, 1*(2).

Kaka, N., Madgavkar, A., Ksihirsagar, A., Gupta, R., Manyika, J., Bahi, K., & Gupta, S. (2021). Digital India: technology to transform a connected nation. McKinsey Global Institute. 2019.

Karsh, B.-T. (2006). Theories of work-related musculoskeletal disorders: Implications for ergonomic interventions. *Theoretical issues in Ergonomics science, 7*(1), 71-88.

Khandoker, A. H., Jelinek, H. F., Moritani, T., & Palaniswami, M. (2010). Association of cardiac autonomic neuropathy with alteration of sympatho-vagal balance through heart rate variability analysis. *Medical engineering & physics, 32*(2), 161-167.

Kim, Y.-M., & Cho, S.-i. (2017). Work–life imbalance and musculoskeletal disorders among South Korean workers. *International journal of environmental research and public health, 14*(11), 1331.

Kivistö, M., Härmä, M., Sallinen, M., & Kalimo, R. (2008). Work-related factors, sleep debt and insomnia in IT professionals. *Occupational Medicine, 58*(2), 138-140.

Krueger, G. P. (1989). Sustained work, fatigue, sleep loss and performance: A review of the issues. *Work & Stress, 3*(2), 129-141.

Laermans, J., & Depoortere, I. (2016). Chronobesity: role of the circadian system in the obesity epidemic. *Obesity reviews, 17*(2), 108-125.

Laranjeira, C. A. (2008). THE DILEMMAS OF THE 'QUALITY OF LIFE'CONCEPT IN PSYCHOLOGICAL PRACTICE. *Psychologia, 51*(4), 304-318.

Lewy, A. J., Wehr, T. A., Goodwin, F. K., Newsome, D. A., & Markey, S. (1980). Light suppresses melatonin secretion in humans. *Science, 210*(4475), 1267-1269.

Lunde, L.-K., Skare, Ø., Mamen, A., Sirnes, P. A., Aass, H. C., Øvstebø, R., . . . Heglum, H. S. A. (2020). Cardiovascular health effects of shift work with long working hours and night shifts: Study protocol for a three-year prospective follow-up study on industrial workers. *International journal of environmental research and public health, 17*(2), 589.

Marangoni, A. H. (2010). Effects of intermittent stretching exercises at work on musculoskeletal pain associated with the use of a personal computer and the influence of media on outcomes. *Work, 36*(1), 27-37.

Mathiazhakan, U., & Jayabharathi, B. (2019). A Study to Assess the Relationship between Sleep Quality and Quality of Life among IT Professionals at SRMIST, Kattankulathur, Kancheepuram District. *International Journal of Nursing Education, 11*(2).

Mohammadi, G. (2012). Risk factors for the prevalence of the upper limb and neck work-related musculoskeletal disorders among poultry slaughter workers. *Journal of Musculoskeletal Research, 15*(01), 1250005.

Morris, C. J., Purvis, T. E., Hu, K., & Scheer, F. A. (2016). Circadian misalignment increases cardiovascular disease risk factors in humans. *Proceedings of the National Academy of Sciences, 113*(10), E1402-E1411.

Nea, F. M., Kearney, J., Livingstone, M. B. E., Pourshahidi, L. K., & Corish, C. A. (2015). Dietary and lifestyle habits and the associated health risks in shift workers. *Nutrition research reviews, 28*(2), 143-166.

Niemiec, C. P., Olafsen, A. H., Halvari, H., & Williams, G. C. (2022). Losing sleep over work: A self-determination theory view on need frustration, sleep disturbance, and mental ill health. *Stress and Health*.

Palhares, V. d. C., Corrente, J. E., & Matsubara, B. B. (2014). Association between sleep quality and quality of life in nursing professionals working rotating shifts. *Revista de saude publica, 48*, 594-601.

Puttonen, S., Härmä, M., & Hublin, C. (2010). Shift work and cardiovascular disease—pathways from circadian stress to morbidity. *Scandinavian journal of work, environment & health*, 96-108.

Reinke, H., & Asher, G. (2016). Circadian clock control of liver metabolic functions. *Gastroenterology, 150*(3), 574-580.

Reiter, R. J., Tan, D.-X., Korkmaz, A., & Ma, S. (2012). Obesity and metabolic syndrome: association with chronodisruption, sleep deprivation, and melatonin suppression. *Annals of medicine, 44*(6), 564-577.

Reynolds, R. S. (2019). *The empirical relationship between global patterns of disease and country-level variation in the balance of nutrients in the diet.* University of Lincoln,

Roth, G. A., Mensah, G. A., & Fuster, V. (2020). The global burden of cardiovascular diseases and risks: a compass for global action. In (Vol. 76, pp. 2980-2981): American College of Cardiology Foundation Washington DC.

Rubery, J., & Grimshaw, D. (2001). ICTs and employment: The problem of job quality. *Int'l Lab. Rev., 140*, 165.

Safety, U. S. O., & Administration, H. (1997). *Working safely with video display terminals*: US Department of Labor, Occupational Safety and Health Administration.

Scarpina, F., & Tagini, S. (2017). The stroop color and word test. *Frontiers in psychology, 8*, 557.

Service, C. O. C., Education, C. O. C. S., Unit, T., Safety, U. S. O., & Administration, H. (1999). *Easy Ergonomics: A Practical Approach for Improving the Workplace*: California Department of Industrial Relations, Cal/OSHA Consultation Service ….

Sethi, J., Sandhu, J. S., & Imbanathan, V. (2011). Effect of Body Mass Index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed

ergonomic setup. *Sports Medicine, Arthroscopy, Rehabilitation, Therapy & Technology, 3*(1), 1-7.

Sharma, P., RANI, M. U., MAHESWARI, K., & Supriya, K. (2012). FOOD HABITS, PREFERENCES AND MEAL PATTERN OF THE PROFESSIONALS IN INFORMATION TECHNOLOGY SECTOR. *The Journal of Research ANGRAU*.

Shavarani, S. M., & Korhan, O. (2015). Expert system assessment of work-related musculoskeletal disorders for video display terminal users. *Applied Research in Quality of Life, 10*(2), 205-216.

Shaw, E., Dorrian, J., Coates, A. M., Leung, G. K., Davis, R., Rosbotham, E., . . . Bonham, M. P. (2019). Temporal pattern of eating in night shift workers. *Chronobiology international, 36*(12), 1613-1625.

Shearer, J., Graham, T. E., & Skinner, T. L. (2016). Nutra-ergonomics: influence of nutrition on physical employment standards and the health of workers. *Applied Physiology, Nutrition, and Metabolism, 41*(6), S165-S174.

Shrivastava, S. R., & Bobhate, P. S. (2012). Computer related health problems among software professionals in Mumbai: A cross-sectional study. *International Journal of Health & Allied Sciences, 1*(2), 74.

Smith, M. J. (1997). Psychosocial aspects of working with video display terminals (VDTs) and employee physical and mental health. *Ergonomics, 40*(10), 1002-1015.

Sztajzel, J. (2004). Heart rate variability: a noninvasive electrocardiographic method to measure the autonomic nervous system. *Swiss medical weekly, 134*(35-36), 514-522.

Tähkämö, L., Partonen, T., & Pesonen, A.-K. (2019). Systematic review of light exposure impact on human circadian rhythm. *Chronobiology international, 36*(2), 151-170.

Vijay, S. A. (2013). Work-related musculoskeletal health disorders among the information technology professionals in India: A prevalence study. *Int J Mgmt Res Bus Strat, 2*(2), 118-128.

Virtanen, M., Heikkilä, K., Jokela, M., Ferrie, J. E., Batty, G. D., Vahtera, J., & Kivimäki, M. (2012). Long working hours and coronary heart disease: a systematic review and meta-analysis. *American journal of epidemiology, 176*(7), 586-596.

Yazdi, Z., Sadeghniiat-Haghighi, K., Loukzadeh, Z., Elmizadeh, K., & Abbasi, M. (2014). Prevalence of sleep disorders and their impacts on occupational performance: a comparison between shift workers and nonshift workers. *Sleep disorders, 2014*.

MANAV RACHNA
Vidyaparivarthsha

Dr. O.P. Bhalla Central Library
Manav Rachna International Institute of Research and Studies
(A deemed-to-be-university under section 3 of UGC Act 1956)

SIMILARITY VERIFICATION CERTIFICATE

Title: Effect of Nutra-Ergonomic Strategies on Physical, Physiological and Psychological Measures in Night Shift Visual Display Terminal Users

Researcher: ANKITA

Registration Number: 19/PhD/1003

Supervisor: Prof. (Dr.) Hoda Raza Rizvi

Department: Physiotherapy

This is to certify that the above mentioned Short Synopsis/Thesis was scanned for similarity index through Turnitin Software on 19/10/2022 with submission ID 1929550673 and the similarity index was found to be 6 %. The complete report running into 32 Pages, 6878 Word count with File Size 3638 KB is being forwarded to the Research Supervisor/DRC/DRB for review.

Dr. O.P. BHALLA CENTRAL LIBRARY
20/10/22
MRIIRS, Faridabad

Date: 20/10/2022

The complete report of the above Short Synopsis/Thesis has been reviewed and the similarity index is below the accepted norms as per the University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations 2018. The Short Synopsis/Thesis may be considered for further processing

Research Scholar

Research Supervisor

Effect of Nutra-Ergonomic Strategies on Physical, Physiological and Psychological Measures in Night Shift Visual Display Terminal Users

by Ankita Sharma

Submission date: 19-Oct-2022 04:46PM (UTC+0530)
Submission ID: 1929550673
File name: ogical_Measures_in_Night_Shift_Visual_Display_Terminal_Users.doc (395K)
Word count: 6878
Character count: 39604

Effect of Nutra-Ergonomic Strategies on Physical, Physiological and Psychological Measures in Night Shift Visual Display Terminal Users

SHORT SYNOPSIS

by

ANKITA SHARMA

Registration number

19/FAS/Phd/003

Under the supervision of

Prof. (Dr.) Moattar Raza Rizvi

Dean, Faculty of Allied Health Sciences

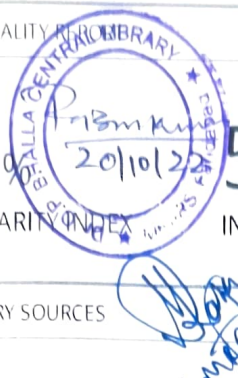
Abstract:

Discomfort in the muscles and joints can have a devastating effect on an employee's productivity and quality of life. Most work-related upper extremity disorders (WRMSDs) occur in the neck, and a wide variety of personal, physical, and psychological variables contribute to their onset and progression. Sleep is an essential piece of a healthy way of life, however with modern advances, there are various developing elements that can obstruct this essential work, causing poor sleep quality (Niemiec, Olafsen, Halvari, & Williams, 2022). Shift work initiates some complaints about sleeping problems like a sleeplessness, poor sleep quality, and daytime sluggishness (Yazdi, Sadeghniiat-Haghighi, Loukzadeh, Elmizadeh, & Abbasi, 2014).

Objective: The objective of the study is to find out the effect of intermittent, work station exercises along with nutra-ergonomic strategies on heart rate variability, musculoskeletal issues, sleep quality, eating attitude, cognitive performance and work ability index.

Effect of Nutra-Ergonomic Strategies on Physical, Physiological and Psychological Measures in Night Shift Visual Display Terminal Users

ORIGINALITY REPORT



Excluding matches
less than 14 words

6%	5%	4%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.ncbi.nlm.nih.gov Internet Source	2%
2	www.mdpi.com Internet Source	1%
3	link.springer.com Internet Source	1%
4	www.ajtmh.org Internet Source	1%
5	www.jstage.jst.go.jp Internet Source	<1%
6	Advances in Intelligent Systems and Computing, 2016. Publication	<1%
7	Submitted to Coventry University Student Paper	<1%
8	Jane Shearer, Terry E. Graham, Tina L. Skinner. "Nutra-ergonomics: influence of	<1%

	nutrition on physical employment standards and the health of workers", Applied Physiology, Nutrition, and Metabolism, 2016 Publication	
9	worldwidescience.org Internet Source	<1 %
10	Shigekazu Higuchi, Yutaka Motohashi, Yang Liu, Mio Ahara, Yoshihiro Kaneko. "Effects of VDT tasks with a bright display at night on melatonin, core temperature, heart rate, and sleepiness", Journal of Applied Physiology, 2003 Publication	<1 %
11	Marginean, Ioan. "Quality of Life Diagnosis (QoLD)", Encyclopedia of Quality of Life and Well-Being Research, 2014. Publication	<1 %
12	studentsrepo.um.edu.my Internet Source	<1 %
13	www.frontiersin.org Internet Source	<1 %

Exclude quotes On

Exclude bibliography On

Exclude matches